# DRAINAGE PLAN

SANDERS
DRAINAGE ANALYSIS
TPM 20845 RPL²
E04-02-028
APN 127-541-08 & 09

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# DRAINAGE ANALYSIS
# TPM 20845
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The project impact on the quantity and pattern of runoff to the surrounding area will be less than significant. The reason is the increase runoff from the project will be less than 1% for the total drainage area and the pattern will not be changed and the quantity will be mitigated by the grass lined swales and bio filters. The sheet flow increased across the access road can be accommodated with two 48" culverts, the offsite drainage facilities will not be impacted by the project.

Siltation and erosion will be controlled by best management practices during construction and grass swales and bio filters for post construction.

The grading plan shows the onsite drainage pattern for the individual parcels and on site roads. The project will take advantage of the existing road along it's easterly boundary, therefore minimizing the impact of roads.

Pre development and post development has been calculated and the onsite flows will be mitigated by bio filters and grass lined swales.

The major flow (150+/- acs) through the property will be carried by the existing swale that parallels West Lilac Road.

Drainage facilities for the existing road along the easterly property line will be improved with twin 48" culverts to carry the flow from the 150 acres offsite.

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Drainage Area mostly offsite flow from east

150 acs.

Watershed L = 4000'
Watershed H = 234'

Soil Group
½ C + ¼ B + ¼ D

S = 5.8%
Lower 2500 ft.
H = 90 Ft.
S = 3.6%

Average C = 0.36

$Tc = 14 + 8 = 22$ mins.

$Q_{85} = 0.36(0.8)(150)$

$I_{85} = 0.8$ in/hr

$Q_{85} = 43.2$ cfs

$I_{100} = 3.6$ in/hr

$Q_{100} = 0.36(3.6)(150)$

$Q_{100} = 195$ cfs

Capacity swale exceeds 195 cfs . . OK

Flow from south        Area = 12 acs.

Soil Group
1/3  B + 1/3 C + 1/3 D

Watershed L = 1100'
Watershed H = 116'
S = 11.6%

Use  C = 0.36

$Tc = 4.2 + 6.4 = 10.6$ mins.

Pre Construction

$Q_{85} = 0.36(1.3)(12)$

$I_{85} = 1.3$ in/hr

$Q_{85} = 5.6$ cfs

$I_{100} = 6.0$ in/hr

$Q_{100} = 0.36(6.0)(12)$

$Q_{100} = 25.9$ cfs

Capacity swale exceeds 26 cfs . . OK

Post Construction

Approximate 0.3 acs will be roofs and an additional 0.3 acs will be paved roadway and driveways.

The revised C will be

$$C_R = \frac{0.6 \text{ acs } (0.81) + 11.4 \ (0.36)}{12} = 0.382$$

$$Q_{85} = 0.382(1.3)(12)$$
$$Q_{85} = 6 \text{ cfs}$$

$$Q_{100} = 0.385(6.0)(12)$$
$$Q_{100} = 27.7 \text{ cfs}$$

Increase flow
$$Q_{85} = 0.5 \text{ cfs}$$
$$Q_{100} = 1.8 \text{ cfs}$$

Increase flow will be mitigated by grass lined swale

Capacity swale exceeds 26 cfs . . OK

Post Construction

Approximate 0.3 acs will be roofs and an additional 0.3 acs will be paved roadway and driveways.

The revised C will be

$$C_R = \frac{0.6 \text{ acs } (0.81) + 11.4 (0.36)}{12} = 0.382$$

$$Q_{85} = 0.382(1.3)(12)$$
$$Q_{85} = 6 \text{ cfs}$$

$$Q_{100} = 0.385(6.0)(12)$$
$$Q_{100} = 27.7 \text{ cfs}$$

Increase flow
$$Q_{85} = 0.5 \text{ cfs}$$
$$Q_{100} = 1.8 \text{ cfs}$$

Flow at west property line          Area = 150 + 12 = 162 acs.
                                    L = 4900 ft.
$Q_{100} = 0.36(3.4)(162)$          H = 249 ft.
$Q_{100} = 198$ cfs                 S = 5%
                                    Tc = 17 mins. + 8 = 25
Revised CR                          $I_{100} = 3.4$ in/hr

$C_R = 12 (0.382) + 150(0.36) = 0.3616$
$Q_{100} = 0.3616 (3.4)(1.62)$
$Q_{100} = 199$ cfs          Increase 1 cfs = 0.5%

Sanders flow capacity existing swale east PL  Parcel "B" B/c 04-130 at road

                              a = 106 sq. ft.
                              wp = 100 ft.
                              r = 1
                              $r = \frac{106}{100} = 1 \quad r^{2/3} = 1$

$Q = \frac{1.486(106)(1)(0.105)}{0.075}$
                              S = 1.1%
                              $S^{1/2} = 0.105$

Q = 220 cfs

Exceed 195 cfs ∴OK

Replace sheet flow across road with twin 48" culverts

Rlow @ road = 195 cfs

Install 48" culverts $\dfrac{HW}{D} = 1.45$

Capacity 100 cfs two culverts
= 200 cfs Exceed 195 cfs
∴ OK

@ PL TPM boundary between parcel 2 and parcel B

existing swale

a = 100 sq. ft.
wp = 100 ft.
$r = \dfrac{100}{100} = 1$   r 2/3 = 1

$Q = \dfrac{1.486(100)(1)(0.105)}{0.075}$

Q = 208 cfs
Exceed 195 cfs ∴ OK